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ABSORBENT ARTICLE

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[There are no amendments to this patent.]

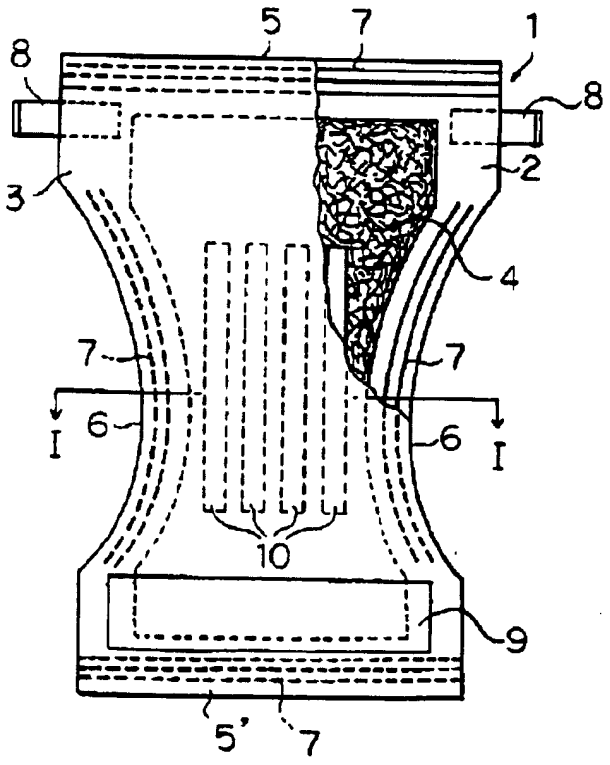
Abstract

Objective

The objective is to provide, in the case of an absorbent article which exhibits a color change when excreta such as urine, etc., has been absorbed, an absorbent article that does not undergo a color change by merely coming into contact with a small amount of water or during storage under high-temperature and high-humidity conditions.

Solving means

A sheet material, which is impregnated with a hydrophilic composition containing an acidic compound and a color indicator which changes color according to the pH and contains a water-soluble compound which becomes basic upon dissolution in water in the back sheet, is used, and when the water-soluble compound comes into contact with water, and this water comes into contact with the hydrophilic composition described above, the pH of the hydrophilic composition is increased to above 4, changing the color of the hydrophilic composition.



Claims

1. An absorbent article characterized by comprising a liquid-permeable top sheet, liquid-impermeable back sheet and liquid-retaining absorbent between the two sheets; containing a hydrophilic composition having an acidic compound and a color indicator which changes color according to pH, wherein the pH can be maintained below 4 by the acidic compound and does not go above 4 even if the hydrophilic compound comes into contact with water; the above back sheet comprising a sheet material containing a water-soluble compound which becomes basic upon dissolution in water; and the pH of the hydrophilic composition exceeding 4 when the above water-soluble compound is dissolved in water, and the solution formed comes into contact with the hydrophilic composition, changing the color of the hydrophilic composition.

2. The absorbent article of Claim 1, wherein the water-soluble compound is an inorganic or organic filler, and the sheet material is a resin composition containing polyolefin and this filler.

3. The absorbent article of Claim 1 or 2, wherein the acidic compound is one or more kinds of compounds selected from vinyl acetate homopolymer, ethylene-vinyl acetate copolymer, ethylene-acrylic acid copolymer, stearic acid, oleic acid, rosin acid, L-ascorbic acid, nicotinic acid, L-glutamic acid, lactic acid and succinic acid.

4. The absorbent article of Claims 1-3, wherein the sheet material is a moisture-permeable sheet material.

5. The absorbent article of Claim 4, wherein the amount of moisture permeating the moisture-permeable sheet is in the range of 0.5-4 g/(100 cm^2·h), and the thickness is in the range of 15-40 μm.

6. The absorbent article of Claim 2, wherein the sheet material contains 100 parts by weight of polyolefin resin and 50-400 parts by weight of filler.

7. The absorbent article of Claims 1-6, wherein the filler is calcium carbonate.

8. The absorbent article of Claims 1-7, wherein the hydrophilic composition additionally contains a viscous hydrophilic polymer.

9. The absorbent article of Claims 1-8, wherein the hydrophilic composition is directly coated on the sheet material.

10. The absorbent article of Claim 9, wherein there is a hydrophilic sheet between the sheet material and hydrophilic composition.

Detailed explanation of the invention

[0001]

Technical field of the invention

This invention pertains to absorbent articles such as disposable diapers, sanitary napkins, etc. In particular, it pertains to absorbent articles wherein a color change indicates when excreta such as urine, etc., has been absorbed.

[0002]

Prior art and problem to be solved by the invention

There is a so-called alert technique enabling the indication of absorption of excreta such as urine, etc., by a disposable diaper by incorporating a substance which changes color according to pH (pH indicator) in the diaper (for example, refer to Japanese Kokai Utility Model No. Sho 63[1988]-177907, Japanese Kokoku Patent No. Hei 2[1990]-5792, Japanese Kokai Patent Application Nos. Hei 2[1990]-58585 and Hei 2[1990]-97584). The technology disclosed in these patents utilizes the phenomenon of the pH of a substance with an added indicator changing to neutral to basic from acidic after coming into contact with water, changing the color of the indicator.

[0003]

However, in the technology disclosed in these patents, there are problems such that 1) the color of the indicator changes with a very small amount of water, and in spite of the diaper still being usable, it signals the need for replacement, and 2) if the diaper is stored under high temperature and humidity conditions, the indicator discolors with any moisture in the atmosphere, eliminating the alert function even before the diaper is used.

[0004]

Therefore, the objective of the present invention is to provide, in the case of an absorbent article which exhibit a color change when excreta such as urine, etc., has been absorbed, an absorbent article that does not undergo a color change by coming into contact with a small amount of water or during storage under high temperature and humidity conditions.

[0005]

Means to solve the problem

The inventors of the present invention conducted diligent research, and as a result, found that it was possible to prepare an absorbent article meeting the above objective by combining a

specific hydrophilic composition containing specific components with a sheet material containing a specific compound.

[0006]

The present invention is based on the finding described above. The above objective has been accomplished by providing an absorbent article characterized by comprising a liquid-permeable top sheet, liquid-impermeable back sheet and liquid-retaining absorbent between the two sheets; containing a hydrophilic composition having an acidic compound and color indicator which changes color according to pH, wherein the pH can be maintained below 4 by the acidic compound and does not go above 4 even if the hydrophilic compound comes into contact with water; the above back sheet comprising a sheet material containing a water-soluble compound which becomes basic upon dissolution in water; and the pH of the hydrophilic composition exceeding 4 when the above water-soluble compound is dissolved in water, and the solution formed comes into contact with the hydrophilic composition, changing the color of the hydrophilic composition.

[0007]

Embodiment of the invention

A preferred embodiment of the absorbent article of the present invention is explained by using a disposable diaper as an example and with reference to the figures as follows. Figure 1 is a partially cut-away plan view of a disposable diaper as a preferred embodiment of the absorbent article of the present invention viewed from the back sheet side. Figure 2 is an enlarged cross section along the line I-I in Figure 1.

[0008]

As shown in Figures 1 and 2, the disposable diaper 1 of this preferred embodiment comprises a liquid-permeable top sheet 2, liquid-impermeable back sheet 3 and liquid-retaining absorbent 4 between these two sheets 2 and 3. The absorbent 4 is formed in an hourglass shape with a narrowed width at the area corresponding to the crotch portion of a diaper, and the top sheet 2 and back sheet 3 are also formed in an hourglass shape at the area corresponding to the hourglass-shaped portion of the absorbent 4. Moreover, the absorbent 4 is held between and fixed to the top sheet 2 and back sheet 4.

[0009]

The back and front waist portions 5 and 5' and a pair of leg portions 6 and 6 formed by the top sheet 2 and back sheet 3 extending to the back, front, left and right edges of the absorbent

4 have an elastically stretchable part 7 installed and fixed between the top sheet 2 and back sheet 3 so that the waist portions 5 and 5' and leg portions 6 and 6 fit snugly to the body of the wearer. The two ends in the width direction of the back waist portion 5 have a pair of fastening parts 8 and 8 made of tape fastener, etc., and the back sheet 3 has a fastening anchor part 9 comprising a rectangular target tape on the front side waist portion 5'. When the disposable diaper 1 of this preferred embodiment 1 is worn, the typing parts 8 and 8 are anchored on the fastening anchor part 9. The configuration described above is the same as that of the previously available disposable diaper.

[0010]

In the disposable diaper 1 of this preferred embodiment as shown in Figures 1 and 2, the back sheet 3 comprises a sheet material containing a water-soluble compound, which is alkaline when dissolved in water, at the same time, four stripes of the hydrophilic composition 10 are coated directly on the inner surface of the back sheet 3 along the length direction and fixed by bonding to the back sheet 3 and absorbent 4. Incidentally, in this specification, "alkaline or basic" means a pH higher than 7.

[0011]

The above hydrophilic composition 10 contains an acidic compound and indicator, the color of which changes with pH, and it is designed so that the pH of the hydrophilic composition exceeds 4 when the above water-soluble compound comes into contact with water, and the solution comes into contact with the hydrophilic composition, thus changing its color.

[0012]

The acidic compound contained in the above hydrophilic composition is a compound which can maintain the pH of the hydrophilic composition below 4 and which will not go above pH 4 as a result of simply coming into contact with water. Specific examples of such an acidic compound include polymers such as vinyl acetate homopolymer, ethylene-vinyl acetate copolymer, ethylene-acrylic acid copolymer, etc.; fatty acids such as stearic acid, oleic acid, etc.; and other acidic compounds such as rosin acid, L-ascorbic acid, nicotinic acid, L-glutamic acid, lactic acid, succinic acid, etc., but it is not necessarily limited to these compounds. These acidic compounds may be used alone or in a combination of two or more kinds. Among these acidic compounds, preferred examples are combinations of vinyl acetate homopolymer and ethylene-acrylic acid copolymer, ethylene-vinyl acetate copolymer and rosin acid, vinyl acetate homopolymer and stearic acid, vinyl acetate homopolymer, rosin acid and ethylene-acrylic acid copolymer, ethylene-vinyl acetate copolymer and lactic acid, L-ascorbic acid and stearic acid,

etc. The above hydrophilic composition contains 50-99.99 wt%, preferably 60-99.99 wt% and optimally 60-90 wt% of these acidic compounds with respect to the entire hydrophilic composition (acidic compounds + color pH indicator). If the amount of acidic compounds is less than 50 wt%, it becomes difficult to maintain the pH below 4, and the color may change simply by coming into contact with water.

[0013]

As a color pH indicator, which is the other component of the above hydrophilic composition, there are those changing color at a specific pH level in the range of 3-7. Specific examples include Bromophenol Blue, Methyl Orange, Alizarin S, Bromocresol Green, Methyl Red, Bromocresol Purple, etc., but it is not necessarily limited to these indicators. Among these indicators, the optimal examples are Bromocresol Green and Bromocresol Purple. The above hydrophilic composition contains 0.01-50 wt%, preferably 0.01-40 wt%, more preferably 0.01-1 wt% and optimally 0.01-0.5 wt% of these color pH indicator with respect to the entire hydrophilic composition (acidic compounds + color pH indicator). If the amount of color pH indicator is less than 0.01 wt%, the color after the change is too faint to detect with the naked eye. On the other hand, if it is greater than 50 wt%, the color of the hydrophilic composition before the color change is so deep that the appearance is poor, and at the same time, the cost is high. Therefore, the content is preferably within the above range.

[0014]

The effects of the present invention are satisfactorily exhibited if the above hydrophilic composition comprises the acidic compound and color pH indicator as described above, but if an adhesive hydrophilic polymer is used in addition to these components, the hydrophilic composition is provided with a hot-melt property allowing an even stronger bonding and fixing with the back sheet 3 and adsorbent 4. In addition, if a hot-melt coating facility is available, it is possible to carry out on-line coating, providing a good processability. Namely, the hydrophilic composition comprising the above acidic compound, color pH indicator and hydrophilic polymer functions as a hot-melt adhesive. The above hydrophilic polymer is not especially limited as long as it is adhesive and hydrophilic, and there are, for example, vinylpyrrolidone homopolymer, polyamide, polyvinyl alcohol, etc. To provide these hydrophilic polymers with suitable hot-melt adhesion, the number average molecular weight is desirably in the range of 500-30,000, preferably 1000-10,000. The amount of these hydrophilic polymers to be used is in the range of 20-50 wt%, preferably 30-40 wt% with respect to the entire hydrophilic composition. If the amount is less than 20 wt%, it may become difficult for the hydrophilic composition to take up water and change color sufficiently. On the other hand, if it is greater than 50 wt%, the amount

of acidic compound compounded is relatively reduced, consequently, it may become difficult to maintain the pH below 4 and the color may change by simply coming into contact with water. Therefore, the amount is preferably within the above range. Namely, the hydrophilic composition is preferably compounded with 25-79.99 wt% of the acidic compound, 0.01-25 wt% of the color pH indicator and 20-50 wt% of the hydrophilic polymer, optimally 30-69.99 wt% of the acidic compound, 0.01-30 wt% of the color pH indicator and 30-40 wt% of the hydrophilic polymer.

[0015]

In addition to these components described above, the hydrophilic polymer may contain additives such as antioxidants, UV absorbents, etc. The amount of these additives may be in the range of 0.5-5 wt%, preferably 0.5-3 wt% with respect to the total amount.

[0016]

The above hydrophilic composition can be prepared by stirring and mixing the respective components described above at, for example, about 150°C for about 60 min.

[0017]

The sheet material used as the back sheet 3 is explained as follows. As described above, the sheet material contains a water-soluble compound which is basic after being dissolved in water. When the sheet material comes into contact with water, the water-soluble compound is dissolved, and the water with the dissolved compound becomes basic. This water-soluble compound is not especially restricted as long as it is soluble in water (it is not necessary for it to be completely soluble in water), and the solution is basic, and for example, it is possible to use an organic or inorganic filler. Specific examples include inorganic fillers such as calcium carbonate, magnesium carbonate, barium carbonate, sodium carbonate, etc., and organic fillers such as sodium oleate, sodium acetate, barium acetate, calcium stearate, etc. Among them, calcium carbonate or calcium stearate may be used optimally.

[0018]

The above sheet material is formed desirably from a resin composition containing the above water-soluble compound and a thermoplastic resin, preferably the filler described above as the water-soluble compound and polyolefin as the thermoplastic resin. The sheet material may be moisture-permeable or -impermeable sheet, but it is preferably a moisture-permeable sheet from the viewpoint of effectively preventing stuffiness inside the diaper and consequent skin irritation.

[0019]

If the above sheet material is a moisture-permeable sheet, the mean particle size of the above filler (water-soluble compound) is desirably less than 30 μm, preferably less than 10 μm and optimally in the range of 0.5-5 μm from the viewpoint of forming many microscopic pores in the sheet material to provide it with sufficient moisture permeability. Furthermore, from the point of uniform dispersion in the above olefinic resin, the filler (water-soluble compound) is preferably surface-treated. For this surface treatment, fatty acids, their metal salts, etc., are preferably used to make the surface hydrophobic. Incidentally, the method known in the industry can be used to prepare this moisture-permeable sheet by adding the above filler (water-soluble compound) to the above polyolefin resin, kneading the mixture and carrying out melt-molding to obtain a film or sheet, which is subsequently single- or double-axially drawn.

[0020]

Moreover, if the above sheet material is a moisture-permeable sheet, the level of moisture permeability is desirably in the range of 0.5-4 g/(100 $cm^2 \cdot h$), preferably 1.0-2.5 g/(100 $cm^2 \cdot h$) from the viewpoint of maintaining satisfactory liquid-impermeability and sufficiently preventing stuffiness inside the diaper and consequent skin irritation of the wearer. Incidentally, the amount of moisture permeability described above is the result of measurement carried out according to JIS Z 0208.

[0021]

The above polyolefin resin is a monoolefin polymer or copolymer of ethylene, propylene, butene, etc. Specific examples of the polyolefin resin include high-density polyethylene, low-density polyethylene, linear low-density polyethylene, polypropylene, crystalline ethylene-polypropylene block copolymer, polybutene, ethylene-vinyl acetate copolymer and their mixtures, and among them, the use of linear low-density polyethylene is preferable because it is pliable and strong.

[0022]

In the above resin composition forming the above sheet material, 100 parts by weight of the above polyolefin resin are compounded with 50-400 parts by weight, preferably 50-250 parts by weight of the above filler (water-soluble compound) so that the level of moisture permeability is suitable, and the water coming into contact with it changes to basic.

[0023]

Furthermore, the above resin composition may be compounded with an ester compound in the amount in the range of 5-50 parts by weight per 100 parts by weight of the above polyolefin resin for the purpose of improving the strength of the sheet material and forming continuous micropores in the sheet material by using only a low drawing proportion. Specific examples of such ester compound include trimethylolpropane esters of stearic acid and adipic acid, castor oil, hardened castor oil, ethylene oxide adducts of hardened castor oil, polyesters of glycols and dimer acids, etc.

[0024]

The thickness of the above sheet material is in the range of 15-40 μm, preferably 20-35 μm considering the sheet strength, handling, thickness control during manufacturing, etc.

[0025]

The unit weight of the above sheet material is not especially restricted, but it is desirably in the range of 15-40 g/m^2, preferably 20-35 g/m^2 considering thickness control at the time of manufacturing, handling, skin feel, etc.

[0026]

The mechanism of color change of the hydrophilic composition in the disposable diaper of this preferred embodiment is explained as follows. When the absorbent 4 absorbs excreta such as urine, etc., excreted by the wearer, the excreta simply comes into contact with the above hydrophilic composition or hydrophilic composition and back sheet 3, very slightly if the amount is small. Meanwhile, the hydrophilic composition contains an acidic substance which can maintain the pH of the hydrophilic composition below 4 and will not exceed 4 in the case of coming into contact with water alone as described above, and consequently, the hydrophilic composition shows no color change when it comes into contact with excreta such as urine, etc., having a pH level about the same or lower than that of water. Moreover, if only a small amount of excreta such as urine, etc., comes into contact with the back sheet 3, the water-soluble compound in the back sheet 3 (sheet material) is hardly dissolved by that excreta alone, consequently, the pH of the excreta is hardly changed, and the color of the hydrophilic composition does not change. As described above, the hydrophilic composition shows no color change if the amount of excreta excreted by the wearer of the diaper is small, thus, it is different from the situation in the case of the disposable diapers of the prior art, and it is possible to prevent the diaper from being changed while it is still usable. Similarly, when the diaper is stored under high temperature and humidity conditions, the hydrophilic composition does not change

color due to the small amount of moisture present in the environment because of the same reasons as those explained above, preventing any color change during storage. On the other hand, when the absorbent 4 absorbs urine, etc., and accumulates it over a certain level, the urine, etc., comes into contact with the back sheet 3 in a sufficient amount, causing the water-soluble compound to elicate from the back sheet 3 (sheet material) changing the pH of the urine, etc., to basic (the pH is increased to about 7-9). When the urine, etc., with the dissolved water-soluble compound comes into contact with the above hydrophilic composition, the pH of the above hydrophilic composition exceeds 4 (changes from acidic to basic), changing the color of the hydrophilic composition. This color change can be confirmed from the outside through the back sheet 3, and thus, this color change can signal that the diaper is ready to be changed.

[0027]

The absorbent article of the present invention has been explained with reference to a preferred embodiment, but the present invention is not necessarily limited to the above preferred embodiment, and various kinds of modifications are possible as long as they do not go beyond the scope of the present invention. For example, in the preferred embodiment described above, the above hydrophilic composition 10 is directly coated on the sheet material forming the back sheet 3, but instead of this configuration, it is possible to insert a hydrophilic sheet 11 such as tissue paper, hydrophilic nonwoven cloth, etc., between the sheet material and hydrophilic composition as shown in Figure 3, enabling increased storage stability under small amounts of water or high humidity. Moreover, in the configurations shown in Figures 2 and 3, the hydrophilic composition 10 is coated as several strips along the length direction of the diaper, but the hydrophilic composition may be coated on the whole surface of the sheet material or hydrophilic sheet described above. In addition to disposable diapers, the adsorbent article of the present invention may be applied to sanitary napkins, urinary incontinence pads, lactation breast pads, etc.

[0028]

Application example

The effectiveness of the absorbent article of the present invention is specifically explained by using application examples as follows. However, the range of the present invention is not necessarily limited to these application examples at all. Incidentally, the '%' used in these examples means '% by weight' unless otherwise specified.

[0029]

Application Example 1

A hydrophilic composition was prepared by mixing 33.8% vinylpyrrolidone homopolymer (hydrophilic polymer), 35% ethylene-vinyl acetate copolymer (acidic compound), 30% rosin acid (acidic compound), 0.2% Bromophenol Blue (color pH indicator) and 1% Irganox 1010 Ciba-Geigy antioxidant (trade name) and stirring the mixture at 150°C. The slot coater method was used to coat the prepared hydrophilic composition as a film on the whole surface of a back sheet made of a moisture-permeable sheet prepared as follows (amount coated: 20 g/m^2, coating temperature 120°C and coating speed: 20 m/min). A mounting sheet (tissue paper) made of 100% pulp and having a unit weight of 19 g/m^2 was laminated over the coated film. An absorbent comprising a mixture comprising fluff pulp and highly absorbent polymer particles was mounted on the mounting sheet, the adsorbent mounted was covered with a top sheet made of a suction heat-bonded nonwoven cloth of polypropylene fiber, an elastically stretchable part was provided on the edge portion between the back sheet and top sheet and fixed by bonding to obtain a disposable diaper as shown in Figure 3.

[0030]

Moisture-permeable sheet preparation procedures

10 parts by weight of an ester compound having the composition and physical properties shown in Table 1 were added to 100 parts by weight of linear low-density polyethylene (Mitsui Petrochemical (K.K.), Ultrazex [transliteration] 2520F (trade name)) and 150 parts by weight of surface-treated calcium carbonate (mean particle size: 1 μm), and the mixture was pelletized by kneading in a double-axial screw-type kneading machine. The pellets prepared were fed to an inflation molding machine to mold an 80 μm thick inflation-molded sheet. The prepared sheet was drawn 2.3 times at 50°C with a roller drawing machine to obtain a porous moisture-permeable sheet. The thickness of the sheet prepared was 40 μm, the moisture permeability level (JIS Z 0208) was 1.8 g/(100cm^2·h), and the unit weight was 20 g/m^2.

[0031]

Table 1

① エステル化合物 (仕込み理論モル比)	② SV (ケン化価)	③ AV (酸価)	OHV ④ (水酸基価)
④ S-40/TMP/AA=4/2/1	240	1.5	8.9

⑤ S－40；ステアリン酸（花王製、ルナックS－40（商品名））
TMP；トリメチロールプロパン
AA；アジピン酸

Key: 1 Ester compound (Theoretical molar ratio charged)

2 SV (Saponification value)
3 AV (Acid value)
4 OHV (Hydroxyl group value)
5 S-40: stearic acid (Kao Sekken, Lunac S-40 (trade name))
TMP: trimethylolpropane
AA: adipic acid

[0032]
Performance evaluation

For the disposable diaper prepared as described above, the extent of color change of the hydrophilic composition was evaluated in the case of absorption of a physiologically saline solution and storage under high temperature and humidity. The results obtained are shown in Table 3.

[0033]

Extent of color change of hydrophilic composition in the case of absorption of a physiologically saline solution

From the top sheet side of the disposable diaper prepared, 5 g or 40 g of a physiologically saline solution were poured, and the diaper was allowed to stand for 2 min. Subsequently, after standing, any color change of the hydrophilic composition was confirmed by the naked eye. The extent of color change was evaluated according to the following grading standards.

O: color change within 2 min
Δ: color change after 2 min but before 10 min had elapsed
X: no color change even after 10 min

[0034]
Extent of color change of hydrophilic composition in the case of storage under high temperature and humidity

The disposable diaper prepared was allowed to stand at 30°C and 90%RH for 24 h, subsequently, it was allowed to return to room temperature (23°C and 65%RH), and the extent of color change of the hydrophilic composition was evaluated based on the following standard.

O: no color change
Δ: slight color change
X: almost complete color change

[0035]

Application Example 2-4

Hydrophilic compositions were prepared using the components shown in Table 2 and carrying out the same procedures as those in Application Example 1. Subsequently, the same procedures as those in Application Example 1 were carried out to prepare disposable diapers, which were evaluated similarly to Application Example 1. The results obtained are also shown in Table 3.

[0036]

Table 2

		① 親水性組成物*		
		親水性ポリマー ② 重量%	酸性化合物 ③ 重量%	呈色指示薬 重量% ④
⑤ 実施例	1	ビニルピロリドンホモポリマー 33.8 ⑥	エチレン／酢酸ビニルコポリマー 35 ロジン酸 30 ⑦	フェノールブルー 0.2 ⑧
	2	ビニルピロリドンホモポリマー 35 ⑥	酢酸ビニルホモポリマー 488 ステアリン酸 15 ⑨	クレゾールグリーン 0.2 ⑩
	3	–	酢酸ビニルホモポリマー 688 エチレン／アクリル酸コポリマー 30 ⑪	フェノールブルー 0.2 ⑧
	4	–	酢酸ビニルホモポリマー 488 ロジン酸 20 エチレン／アクリル酸コポリマー 30 ⑫	フェノールブルー 0.2 ⑧

⑬*・・・実施例1～4それぞれにおいて酸化防止剤（イルガノックス1010）を1重量%含有する。

Key:
1 Hydrophilic composition*
2 Hydrophilic polymer wt%
3 Acidic compound wt%
4 Color pH indicator wt%
5 Application Example
6 Vinylpyrrolidone homopolymer
7 Ethylene-vinyl acetate copolymer 35
Rosin acid 30
8 Bromophenol Blue
9 Vinyl acetate homopolymer
Stearic acid

10 Bromocresol Green
11 Vinyl acetate homopolymer
Ethylene-acrylic acid copolymer
12 Vinyl acetate homopolymer
Rosin acid
Ethylene-acrylic acid copolymer
13 *: The respective compositions of Application Examples 1-4 contain 1 wt% of an antioxidant (Irganox 1010)

[0037]

Application Example 5

A disposable diaper was prepared using the same procedures and conditions as those in Application Example 1 except that the calcium carbonate in the back sheet of Application Example 1 was changed to calcium stearate, and the disposable diaper prepared was evaluated using the same procedures as those in Application Example 1. The results obtained are shown in Table 3.

[0038]

Comparative Example 1-4

Disposable diapers were prepared using the same procedures and conditions as those in Application Example 1-4 except that a sheet made of linear low-density polyethylene was used as a back sheet, and the disposable diapers prepared were evaluated using the same procedures as those in Application Example 1. The results obtained are shown in Table 3. Incidentally, the back sheet used in these comparative examples contained no water-soluble compound.

[0039]

Comparative Example 5

A composition (hot-melt adhesive) was prepared from the following composition described in Application Example 1 of Japanese Kokoku Patent No. Hei 2[1990]-5729 using the same procedures as those described in the same patent. A disposable diaper was prepared using the same procedures and conditions as those in Application Example 1 of the present invention except that the composition prepared as described above and a sheet made of linear low-density polyethylene were used, and the disposable diapers prepared were evaluated using the same procedures as those in Application Example 1. The results obtained are shown in Table 3.

- Hydrophilic polymer: vinylpyrrolidone-vinyl acetate copolymer 46%
- Acidic compound: ethylene-acrylic acid copolymer 18%

fatty acid (Emersol 871) 36%

- Color pH indicator: Bromophenol Blue 0.05%
- Antioxidant: Irganox 0.1%

[0040]

Comparative Example 6

A composition (hot-melt adhesive) was prepared from the following composition described in Application Example 2 of Japanese Kokoku Patent No. Hei 2[1990]-5729 and using the same procedures as those described in the same patent. A disposable diaper was prepared using the same procedures and conditions as those in Application Example 2 of the present invention except that the composition prepared as described above and a sheet made of linear low-density polyethylene were used, and the disposable diaper prepared were evaluated using the same procedures as those in Application Example 1. The results obtained are shown in Table 3.

- Hydrophilic polymer: vinylpyrrolidone-vinyl acetate copolymer 40%
- Acidic compound: fatty acid (Emersol 871) 50%
- Water-soluble wax: Carbowax 4000 10%
- Color pH indicator: Bromophenol Blue 0.07%
- Antioxidant: Irganox 0.1%

[0041]

Table 3

		②	使い捨ておむつ ①		
			生理食塩水を吸収した場合の変色		高温・高湿下で保存した場合の変色 ③
			5 g	40 g	
④	実施例	1	×	○	○
		2	×	○	○
		3	×	○	○
		4	×	○	○
		5	×	○	○
⑤	比較例	1	×	×	○
		2	×	×	○
		3	×	×	○
		4	×	×	○
		5	△	○	×
		6	△	○	×

Key: 1 Disposable diaper
2 Color change in the case of absorption of a physiologically saline solution
3 Color change in the case of storage under high temperature and humidity
4 Application Example
5 Comparative Example

[0042]

As apparent from the results shown in Table 3, the disposable diapers (product of the present invention) of Application Examples 1-5 containing a hydrophilic composition comprising specific components and being prepared using a specific sheet material as a back sheet were found to exhibit color changes when an adequate amount of physiologically saline solution was absorbed compared with the disposable diapers of Comparative Examples 1-4 containing no water-soluble compound in the back sheet. Moreover, compared with the disposable diapers of Comparative Examples 5 and 6 with the previously available wetness-indicating hot-melt adhesives used, color changes were observed with an adequate amount of physiologically saline solution absorbed, and at the same time, the color change was prevented from occurring in the case of storage under high temperature and humidity.

[0043]

Effect of the invention

As explained above in detail, the absorbent article of the present invention does not exhibit a color change when coming into contact with only a small amount of water; furthermore, no color change is observed in the case of storage under high temperature and humidity, and consequently, it is possible to prevent premature changing of the diaper while it is still usable and color change during storage.

Brief description of the figures

Figure 1 is a partially cut-away plan view viewed from the back sheet side of a disposable diaper of one preferred embodiment of the absorbent article of the present invention.

Figure 2 is an enlarged cross section of Figure 1 along the line I-I.

Figure 3 is a drawing equivalent to Figure 2 showing another preferred embodiment of the absorbent article of the present invention.

Explanation of the reference symbols

1: disposable diaper

2: top sheet

3: back sheet

4: absorbent

10: hydrophilic composition

11: hydrophilic sheet

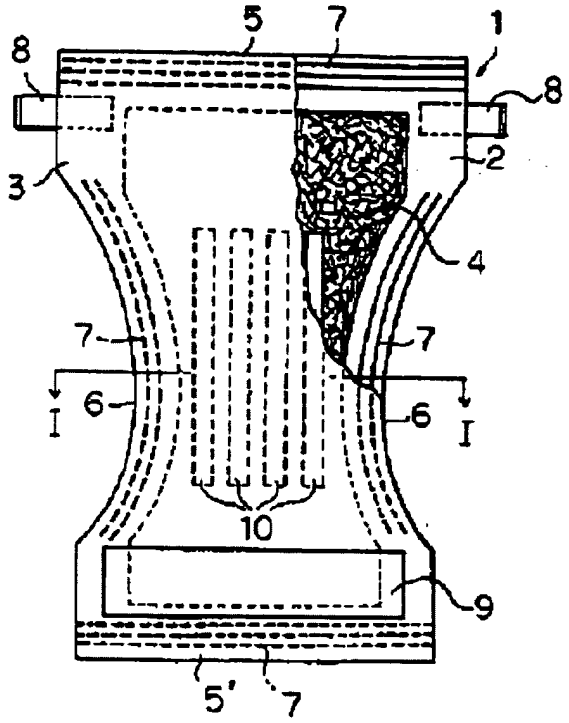


Figure 1

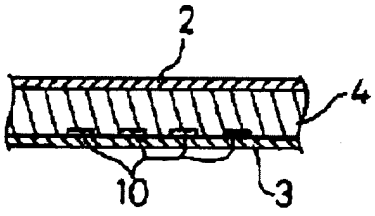


Figure 2

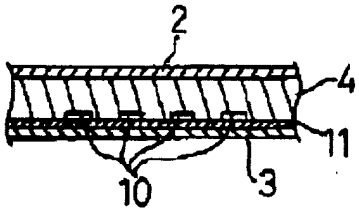


Figure 3